

NAVSEA  
STANDARD ITEM

FY-00

ITEM NO: 009-15  
DATE: 13 SEP 1996  
CATEGORY: II

1. SCOPE:

1.1 Title: Rotating Machinery; balance

2. REFERENCES:

a. None.

3. REQUIREMENTS:

3.1 Measure and record the maximum eccentricity of the rotor shaft and installed components relative to the points of support using dial indicators.

3.2 Balance rotating machinery assemblies or components in accordance with the following requirements and procedures:

3.2.1 Except for propellers, if the design operating speed of the component to be balanced is less than 150 revolutions per minute (RPM), the rotor including shaft shall be balanced by symmetrically supporting the rotor on two knife edges and applying a correction to attain a gravity balance.

3.2.2 Except for propellers, if the design operating speed of the component to be balanced is equal to or greater than 150 RPM, the rotor including shaft shall be balanced with equipment which requires rotation of the work piece.

3.2.3 Propellers shall be statically balanced in a single plane by rotating on dynamic equipment, using a constant rotational speed, in order to ensure an accurate static balance. Controllable pitch propeller blades shall be similarly balanced in hub sets on a dummy hub.

3.2.3.1 The dynamic equipment shall be capable of detecting an unbalance of one-tenth of the allowable unbalance criteria at the chosen rotation speed.

3.2.3.2 The allowable unbalance criteria for a propeller shall be that specified on the applicable propeller drawing. If not specified in the drawing, the allowable unbalance shall be determined by the appropriate formula in 3.2.5.

#### 3.2.4 Types of correction:

TYPES OF CORRECTION	N 1/	ROTOR CHARACTERISTIC 1/
Single-plane	0 - 1000	L/D Less than or Equal to 0.5
	0 - 150	L/D Greater than 0.5
Two-plane	Greater than 1000	L/D Less than or Equal to 0.5
	Greater than 150	L/D Greater than 0.5
Multi-plane		Flexible: Unable to correct by two-plane balancing

1/

L = Length of rotor mass, exclusive of shaft

D = Diameter of rotor mass, exclusive of shaft

N = Maximum operating RPM

3.2.5 Allowable unbalance: The values determined by the following formulas are permitted in each plane of correction. However, if unbalance is measured in two or more planes, the resultant unbalance forces cannot exceed the allowable amount determined by single plane correction.

$$U = \frac{4W}{N}$$

N for maximum operating speeds in excess of 1000 RPM, or

$$U = \frac{4000W}{N^2}$$

N<sup>2</sup> for maximum operating speeds between 150 RPM and 1000 RPM, or

$$U = 0.177W \text{ for maximum operating speeds below 150 RPM}$$

U = Maximum allowable residual unbalance in ounce-inches

W = Weight of rotating parts in pounds

N = Maximum operating RPM of rotating parts being balanced

3.2.6 When the computation for converting displacement measurements to ounce-inches of force unbalance is an approximation, verification shall be made by adding a trial weight to the rotor, equal and opposite to the calculated ounce-inches of force. If putty is used as a trial weight, it shall be removed, weighed and a permanent compensating weight shall be installed in its place.

3.3 Submit four legible copies of a report listing results of the requirements of 3.1 and 3.2 to the SUPERVISOR. The report shall include the following information:

3.3.1 Ship's name and hull number

- 3.3.2 Contractor and subcontractor
  - 3.3.3 Job Order and Work Item number
  - 3.3.4 Unit and component identification
  - 3.3.5 Manufacturer and model number of balance machine
  - 3.3.6 Date of last calibration, by whom it was calibrated, and when the next calibration is due for the balancing machine
  - 3.3.7 Maximum total indicated runout of rotor or balancing arbor
  - 3.3.8 Weight of rotor assembly in pounds
  - 3.3.9 Design operating RPM of rotor
  - 3.3.10 Computation of allowable unbalance in ounce-inches
  - 3.3.11 Measured unbalance, prior to and after balancing, in ounce-inches
- 3.4 Submit four legible copies of a report listing computations or procedures for converting displacement measurements to ounce-inches of unbalance force to the SUPERVISOR, when the machine used to balance components indicates displacement measurements in lieu of direct unbalance forces.

4. NOTES:

- 4.1 None.